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EVALUATION OF INSECTICIDE MOLECULES AGAINST TURMERIC SHOOT BORER, *CONOGETHES PUNCTIFERALIS* GUEENE (LEPIDOPTERA: PYRALIDAE)

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ABSTRACT

All the tested insecticides were effective in suppressing the incidence of C. Punctiferalis. Larval population was significantly less, in all the treated plots than untreated check. At three days after application, carbofuron and lamda cyhalothrin recorded higher larval mortality, over check of 54.79 percent, carbofuron application recorded better result, by controlling 72.60 percent larval mortality over check, within seven days followed by lamda cyhalothrin and chloropyripos (64.38%). At fifteen days, after application of lamda cyhalothrin 58.75 percent control of larval mortality, over untreated check was observed. The botanical pesticide nimbicidine was also effective, in reducing the pest and recorded significantly lower larval mortality over control. The higher mean larval mortality was observed in lamda cyhalothrin (59.30 percent), followed by carbofuron (56.63 percent) and chloropyripos (53.19 percent).

KEYWORDS: Turmeric, Shoot Borer, Conogethes Punctiferalis, Mortality

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Original Article

INTRODUCTION

India is considered as '*The land of spices'*. Turmeric is an important commercial spice crop, grown in India and it is named as "Indian saffron". Indian turmeric is considered the best in the world, due to presence of high curcumin content. Botanically, it is named as *Curcuma longa* L. and belongs to family Zingiberaceae. India accounts for 80 percent of the world output of turmeric and considered as the largest producer, consumer and exporter of turmeric in the Globe. Andhra Pradesh (57%), Tamil Nadu (23%), Karnataka (6%) and Orissa (4%) are some of the important states cultivate turmeric (Anon, 2009). During 2010-2011 India produced 9, 92,900 tons of turmeric from an area of 1, 95,100 hectares (Anon, 2011a). The provisional estimates of area and production of turmeric in Karnataka, during 2010-2011 was 90,448 tons from 18,035 hectares (Anon, 2011b). More than 30 species of insects have been reported to infest the crop in India, including under storage, among which, shoot borer (*Conogethes punctiferalis* Guen.) is the most serious pest (Devasahayam and Koya, 2004). Yield losses of 25 percent have also been reported, when 23 to 24 percent of a plant's pseudo stems are infested (Nybe, 2001). The use of insecticide has become an inevitable method, in the management of shoot borer of turmeric, in the absence of availability of resistant varieties for shoot borer. Keeping these points in view, the present investigation was undertaken.

MATERIAL AND METHODS

The investigation on the evaluation of insecticides against shoot borer *C. punctiferalis* was conducted

during 2013- 14 at College of Agriculture UAHS, Shimoga is presented below. A local turmeric variety was sown in 2 m x 5 m in a Randomized Complete Block Design (RCBD), with three replications, by following package of practices except plant protection measures. Sowing was done on 24th may, 2013 with a spacing of 45 cm X 30 cm between the row and plants, respectively. The observation was recorded on the number of larvae per shoot, from selected five plants in each plot and plants were tagged with wax labels. Spray and whorl application of insecticides were applied on turmeric crop, after noticing the incidence of shoot borer. Pretreatment count was taken one day before application, while post treatment counts were taken at three, seven and 15 days after application. The total number of larvae per five plants was also recorded. The details of treatments and dosages are given in table 1. The number of larva per shoot was recorded by destructive sampling of five randomly selected plants, in each plot. The stems were split open to count the number of larvae per shoot and also the percent larval mortality, over untreated check was calculated by using below mentioned formula.

$$Percent\ larval\ mortality = \frac{No.of\ larva\ in\ check - No.of\ larva\ in\ treatment}{No.of\ larva\ in\ check} \times 100$$

RESULTS AND DISCUSSIONS

The evaluation of different insecticides on the mortality of *C. punctiferalis* larvae, at 3, 7 and 15 days after spraying are presented in the table 2. The mean number of larvae at three days after spraying was varied significantly among treatments, ranged from 0.33 to 0.73 larva per shoot, while number of larval count was less in lamda cyhalothrin, carbofuran (0.33) and which, was on par with phorate, chlorantronilprole, chlorpyrifos, imidacloprid and fipronil (0.40). Higher number of larva noticed in untreated check (0.73), which differed significantly from other treatments, followed by nimbicidine (0.53). The percent larval mortality over untreated check ranged from 27.39 to 54.79 percent. The higher larval mortality of 54.79 percent was recorded, in carbofuran 3G. The larval mortality was 27.39 percent, recorded in Nimbicidine treated plot and differed significantly, from untreated check (0.00 %) (Table 2).

At seven days after spraying the mean number of larva observed was varied significantly, among treatments which was ranged from 0.20 to 0.73 larva per shoot, with lowest number of larval count noticed in carbofuran (0.20) and which was on par with lamda cyhalothrin, chlorpyrifos (0.26), phorate, chlorantronilprole, fipronil (0.33) and imidacloprid (0.40), and Higher number of larva was noticed in untreated check (0.73), which differed significantly from other treatments followed by nimbicidine (0.53). The percent larval mortality in treated plots over untreated check, ranged from 36.98 to 72.60 percent. The higher larval mortality of 72.60 percent was recorded in carbofuran 3G. The lower larval mortality of 36.98 percent was recorded with nimbicidine and differed significantly, from untreated check (0.00 %) (Table 2).

The significant variation among treatments with respect to mean number of larva was observed at 15 days after sowing. It was ranged from 0.33 to 0.80 larvas per shoot, with lower number of larva was noticed in lamda cyhalothrin (0.33) and which was on par with chlorpyrifos, chlorantronilprole (0.40), carbofuran, phorate, fipronil and imidacloprid (0.46). Higher number of larva was noticed in untreated check (0.73), which differed significantly from other treatments followed by nimbicidine (0.53). The percent larval mortality over untreated check ranged from 25 to 58.75 percent. The higher larval mortality of 58.75 percent was recorded with lamda cyhalothrin. The lower larval mortality of 25 percent was recorded with nimbicidine and differed significantly, from untreated check (0.00 %) (Table 2).

The mean per cent larval mortality over untreated check, ranged from 29.79 to 59.30 percent. The higher larval mortality of 59.30 percent recorded with lamda cyhalothrin, followed by carbofuron (56.63 %) and chlorpyrifos (53.19 %).

The lower larval mortality of 29.79 percent recorded with nimbicidine, which differed significantly from untreated check (0.00 %) (Figure 1).

Higher larval mortality was recorded in carbofuron treated plot; this could be due to the fact that, young larvae before gaining entry into the shoot get exposed to the carbofuron. Present results of lamda cyhalothrin are in conformity, with the reports of Evangelista (1995) who reported that, significant reduction of *C. punctiferalis* (8.09%). This was due to quick knockdown effect of lamda cyhalothrin.

Present finding on chlorpyriphos against *C. punctiferalis*, is in accordance with the reports of Patel *et al.* (1987) they reported that, lowest infestation was in plots sprayed with 1.5% chlorpyriphos dust. Similarly, Gopakumar *et al*. (2006) reported that, *C. punctiferlis* on cardmom was effectively controlled by spraying of chloropyriphos 50 EC. Present reports on effectiveness of Nimbicidine against *C. punctiferalis*, are in line with the reports of Virendra and Kesar (2003) and Anon, (2004) they reported that, Neem oil was least effective.

On the whole study, on the evaluation of insecticide molecules revealed that, the higher mortality was observed at seven days after spraying whereas, lesser mortality at 15 days after spraying and this is due to the efficacy of insecticides. The number of day's increases the insecticide loses its efficacy due to rain and sun light.

CONCLUSIONS

The higher benefit cost ratio was obtained in lamda cyhalothrin 2.5% EC, followed by chlorpyrifos 20 EC, carbofuran 3G, phorate 10G and chlorontronilprole 0.4% G with B: C ratio of 2.38, 2.07, 2.04, 1.89 and 1.87, respectively. Minimum B: C ratio of 1.15 was observed in untreated check and it was 1.27 and 1.44 in nimbicidine and imidacloprid 17.8 % SL respectively then comes fipronoil 5% SC with 1.64 (table 2).

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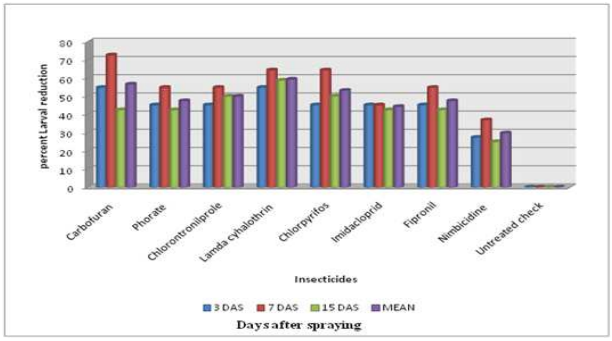

Figure1: Performance of Different Insecticides Against Shoot Borer on Different Days after Treatment

Table 1: Insecticide Molecules Evaluated for Management of Turmeric Shoot Borer

Treatments	Insecticides	Concentration	Dosage	Method of Application
T_1	Carbofuran	3G	12.5 kg/ha	whorl application
T_2	Phorate	10G	15 kg/ha	whorl application
T_3	Chlorontronilprole	0.4% G	10 kg/ha	whorl application
T_4	Chlorpyrifos	20% EC	2 ml/ L	Foliar spray
T_5	Lamda cyhalothrin	2.5% EC	1ml/L	Foliar spray
T_6	Imidacloprid	17.8 % SL	0.5 ml/L	Foliar spray
T_7	Fipronil	5% SC	1ml /L	Foliar spray
T_8	Nimbicidine	1000 ppm	5ml/L	Foliar spray
T_9	Untreated check	-	-	No spray

Table 2: Evaluation of Insecticide Molecules against Shoot Borer

Treatments	Mean No. Of Larvae Per Shoot (1 DBS)	Mean Number of Larvae Per Shoot			Per Cent Larval Mortality Over Untreated Check				B: C Ratio
		3 DAS	7 DAS	15 DAS	3 DAS	7 DAS	15 DAS	Mean	
Carbofuran	0.66	0.33(0.90)^{a}	0.20(0.83)^{a}	0.46(0.97)^{ab}	54.79	72.60	42.50	56.63	2.04
Phorate	0.73	0.40(0.94)^{ab}	0.33(0.90)^{ab}	0.46(0.97)^{ab}	45.20	54.79	42.50	47.49	1.89
Chlorontronilprole	0.53	0.40(0.94)^{ab}	0.33(0.90)^{ab}	0.40(0.93)^{a}	45.20	54.79	50.00	49.99	1.87
Lamda cyhalothrin	0.60	0.33(0.90)^{a}	0.26(0.86)^{ab}	0.33(0.90)^{a}	54.79	64.38	58.75	59.30	2.38
Chlorpyrifos	0.53	0.40(0.94)^{ab}	0.26(0.86)^{ab}	0.40(0.94)^{a}	45.20	64.38	50.00	53.19	2.07
Imidacloprid	0.60	0.40(0.94)^{ab}	0.40(0.93)^{ab}	0.46(0.97)^{ab}	45.20	45.20	42.50	44.30	1.44
Fipronil	0.60	0.40(0.93)^{ab}	0.33(0.90)^{ab}	0.46(0.97)^{ab}	45.20	54.79	42.50	47.49	1.64
Nimbicidine	0.66	0.53(1.00)^{b}	0.46(0.97)^{b}	0.53(1.04)^{b}	27.39	36.98	25.00	29.79	1.27
Untreated check	0.66	0.73e(1.10)^{c}	0.73(1.10)^{c}	0.80(1.14)^{c}	-	-	-	-	1.15
S.Em.±	0.04	0.03	0.03	0.03					
CD at 5%	NS	0.09	0.11	0.09					

DAS= days after spraying; DBS= day before spraying, NS=non significant

The values in the parenthesis are square root transformed values

Values in each column superscripted by same letter do not differ significantly